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AUTHOR Caler, Michelle
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ABSTRACT

This document describes the Cooperative Satellite Learning Project (CSLP) which is designed to educate students in the areas of space science, engineering, and technology in a business-like atmosphere. The project is a partnership between the National Aeronautics and Space Association (NASA), Allied Signal Technical Services Corporation, and member schools and their communities. CSLP students work with Small Explorer (SMEX) series satellites that average three years from design to launch and data collection. The project encourages student input and leadership by appointing a core group of students to head different sub-groups including mission monitoring station, multimedia, outreach, fine arts, publishing, newsletter, telecommunications, video, accounting and administration, supercomputing, and mechanical. (JRH)

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The Cooperative Satellite Learning Project

The CSLP, or Cooperative Satellite Learning Project, is designed to educate students in the areas of space science, engineering, and technology in a business-like atmosphere. The project is a partnership between NASA, Allied Signal Technical Services Corporation, and member schools and their communities. Founded in 1990 by Michael Fatig, the program began at Laurel High School in Laurel, Maryland. Laurel worked with SAMPEX, the Solar Anomalous Magnetospheric Particle Explorer, observing its construction, launch, and early orbit. SAMPEX is still functional today. The project was such a success that another high school, South Fayette Junior Senior High School in McDonald, Pennsylvania, was permitted to join the project in 1993 to work with FAST, the Fast Auroral Snapshot Explorer. At the end of 1994, two more schools had been added: Duval High School in Greenbelt, Maryland and Woodlawn High School in Baltimore, Maryland. They too were assigned to work with FAST. By June 1995, another pair of schools joined the project: Old Bridge High School in Old Bridge, New Jersey and Utica High School in Utica, Michigan.

CSLP students work with Small Explorer series satellites. SMEX satellites are built quickly and inexpensively. They are constructed at NASA's Goddard Space Flight Center in Greenbelt, MD. Goddard Space Flight Center is also home to NASACOM, NASA's internal communications network. Launched frequently, SMEX satellites average three years from design to launch and data collection. The small size of the satellites and the fast construction time does not compromise the quality of the data collected, though. Playing an important part in revolutionizing space science, SMEX satellites are the "wave of the future" in terms of the space program.

An innovative project, CSLP encourages student input and leadership. A "core group" of students is appointed to head "sub-groups," putting management in charge of the students themselves. With the supervising teacher as the "president" of the "corporation,"

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the core group serves as the "vice-presidents." Classroom leaders are like managers. Finally, the remaining students serve as regular business employees.

Students are assigned to write proposals for the projects they wish to do. They must tell why they want to do a particular project, how they will do it, how long it will take, and how it will benefit CSLP. Both the teacher and supervising core group member give the student a grade. A work breakdown structure, WBS, is turned in with the proposal; this is a list of the important tasks needed to be accomplished for the task to be completed. As they work on their project, students keep track of how long it takes to complete their tasks, in effect time-tracking their progress. Once the proposal is completed, they must tell why they varied from their original time frame and how such mistakes may be avoided in future endeavors.

A variety of groups are organized to give students a broader application of their interests and expertise. There are ten major sub-groups in the project.

MMS (Mission Monitoring Station): provides students the opportunity to track the satellite, monitor satellite health, and become familiar with the science aspects of the mission.

Multimedia: encourages use of computers to create digital videos and other computer generated art.

Outreach: presents CSLP, NASA, and FAST to the public, particularly to neighboring schools.

Fine Arts: highlights the musical and artistic talents of the students.

Publishing: is attempting to publish a book of science fiction short stories, as well as magazine articles submitted to teaching and scientific journals.

Newsletter: is in charge of publishing a monthly newspaper about the project, and distributes it to the school, local businesses, and the community.

Telecommunications: uses E-mail and the Worldwide Web to communicate with other schools in the project as well as Goddard Spaceflight Center (NASA) in Greenbelt.

Maryland; the University of California at Berkeley; Poker Flats, Alaska; and a variety of scientific institutions.

Video: films all lectures and guest speakers to send to other schools.

Accounting and Administration: is in charge of organizing files and keeping track of financial records, as well as raising funds for computers and trips to Goddard Space Flight Center.

Supercomputing: completes scientific analysis of data received from the spacecraft, using high speed CRAY supercomputers.

Mechanical: builds scale models of the satellite

In four of the six schools, the project is only a "pull out" activity; students are pulled out of class for lectures, meetings, and guest speakers. At Laurel and South Fayette, a scheduled class is held during school hours. Guest lecturers come in to speak to students, aiding the learning process. Sample lecture topics for the past three years include orbital mechanics, the mechanical subsystem of FAST, an overview of FAST science, and the Pegasus XL launch vehicle. Most days are "objective days"--days for accomplishing goals and special projects. A few "pull-out" days are scheduled a year, for the entire group. This occurs when important speakers arrive, or other special occasions arise.

Throughout its four years of existence, CSLP has been recognized as an innovative approach to teaching, a model for the future. In the first year of the project, Laurel presented their project to former President George Bush, various scientific groups, and teaching and educational conferences. They spent one year learning the engineering of SAMPEX, as well as the science of its mission, before assisting with the launch. They were involved with real-time tracking of the satellite, interpreting scientific data, and got the opportunity to fly the satellite.

Since joining the project in 1993, South Fayette has become one of the leaders in the CSLP project. Amid speculation that the project might fail, as South Fayette is located at a great distance away from Goddard Spaceflight Center, it more than proved that the

project could be instituted in distant schools. In the three years that South Fayette has been in the project, it has been recognized by the Allegheny County Board of Commissioners, presented itself to over 2,500 regional grade school students through the Outreach sub-group's educational programs, and presented the program to the Governor of Pennsylvania. South Fayette's CSLP has given presentations at numerous scientific and teaching conferences. Due to the fundraising sub-group, South Fayette has raised funds to pay for trips to Goddard Spaceflight Center and to fund the purchase of several new computers. Money for computers has also been donated to the project from Allied Signal Technical Services Corporation. Publishing has seen one of its articles, "The Business of Education," published in the March 1996 issue of ***The Science Teacher***. A community "Board of Directors" keeps the program in touch with the community. Mr. CJ Rodkey, CSLP coordinator at South Fayette, is a 1995 Milken Award winning teacher. One of the proudest moments for the project was the presentation of an award for outstanding teamwork among the Outreach sub-group, presented by Jim Willetts, representing NASA headquarters. Such an award is usually presented only to divisions inside NASA.

For five out of the six schools now in CSLP, South Fayette included, the launch of FAST will be a first. Plans are being made to involve all six schools in the August 12, 1996, festivities. South Fayette is planning to open its project to the community, for the most important date in its history so far. Presentations will be given August 11, and will detail such topics as SMEX, Goddard Space Flight Center, FAST, and CSLP. Should the launch of FAST go well, SWAS, the Submilimeter Wave Astronomy Satellite, will be launched the fall of the same year.